
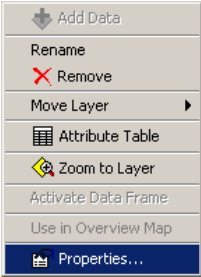


Getting Started with ArcExplorer—Java Edition for Education – Lesson 2

This lesson covers the following ideas, tools, and capacities:

- Classification
- Symbolization
- Histogram
- Naming layers
- Labeling features
- MapTips

1.  Start AEJEE. Choose to open an existing project by clicking the "Open..." button or choose the menu item "FILE/OPEN". Navigate to where AEJEE data and projects are stored and choose "us_hd.axl". Click the file and click "Open".
2. Set your map so only the layer called "**states: CropAcres97**" is turned on. It has been set up to show each state in one of five categories, according to how many acres of cropland it had in 1997. The darkest looking states had the most (over 20 million acres), and the lightest states had the fewest acres of cropland.

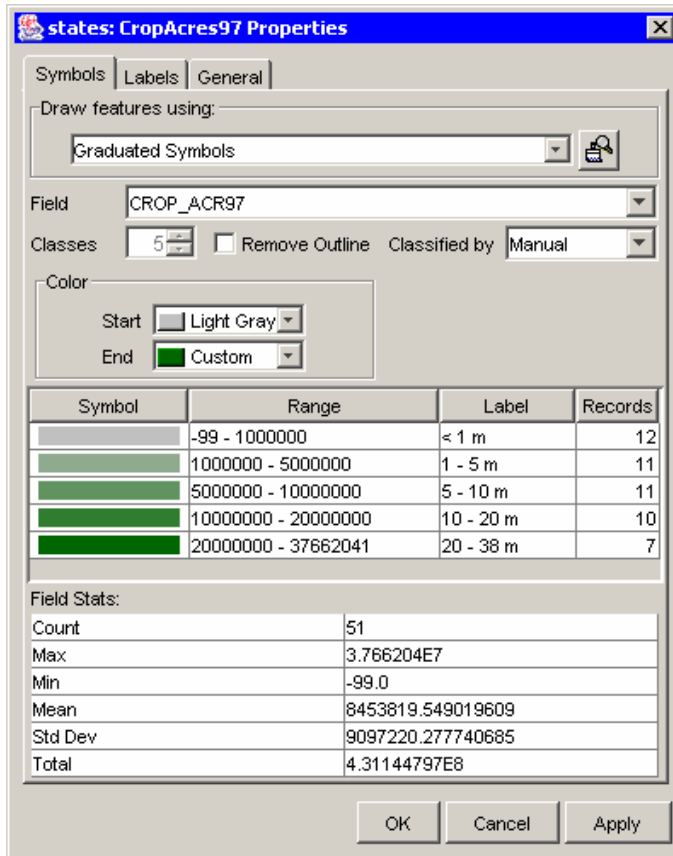
3.  Right-click on "**states: CropAcres97**" and scroll down to choose "**Properties**". This provides access to the window where you can control how the layer is displayed.

NOTE: The power of a map is that it is a model, a simplified version of reality, which allows the viewer to see particular patterns. In order for maps to do this well, characteristics of the real world must be represented in a manner that is easy for the viewer to understand. Classifying (or grouping) and symbolizing the information so that a viewer can make sense of it easily is a key challenge in making any map. In GIS, the map making process goes hand-in-hand with the map viewing process; GIS users get to experiment with different strategies for display. GIS users follow these steps:

- Think about a topic or a place ...
- Ask a question about it ...
- Make a map ...
- Explore the patterns that appear ...
- Enhance the data or modify the analysis ...
- Ask a new question ...
- Repeat ...

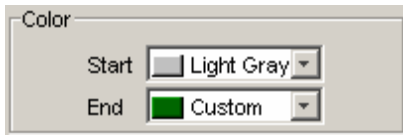
GIS allows the user to modify the data being examined as well as the manner of representation. Later lessons will deal with adding data; this lesson focuses on the process of classification and symbolization.

4.



All the elements of the current window focus on classification and symbolization, because the **"Symbols"** tab at the top is in front. Notice that the layer is currently drawn with a **"Graduated Symbols"** method, using the field **"CROP_ACR97"**. The layer has been broken into five classes, colored from light gray to deep green, and classified manually in nice round numbers, with labels that are a little easier to read than the raw numbers.

5.



First, let's adjust the color scheme. Suppose that, instead of light gray to deep green, you want a palette from light yellow to dark brown. Go to the **"Color"** portion of the window and click the pull-down next to **"Light gray"**.

6.

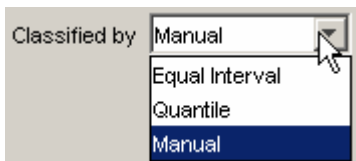


Since there is not a light yellow choice already available in the list of colors, you'll have to choose a **"Custom"** color. In the Color Chooser window, click the light yellow, then click **"OK"**. Back in the symbols editor, your symbols have already changed a little bit. Now, click on the pull-down next to the **"End"** color (currently dark green), then scroll up and choose dark brown. The colors will ramp from light yellow to brown. Click **"OK"** to apply your new color scheme.

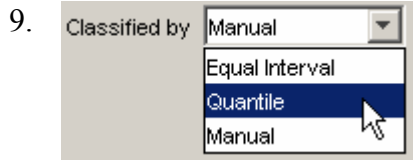
7.

Customizing the colors is good, but we need to do more. Bring up the **"Properties"** window for **"states: CropAcres97"** again.

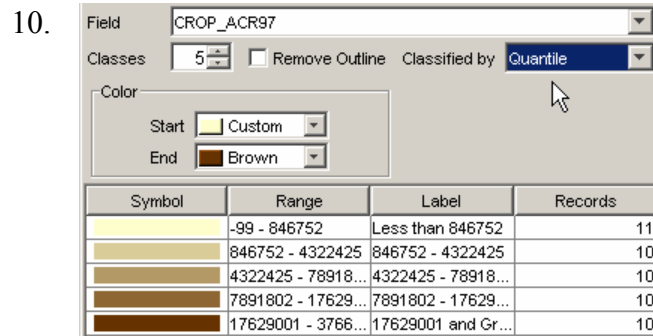
8.



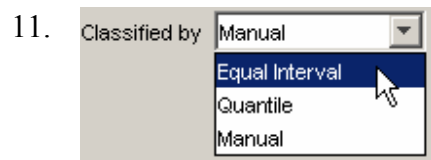
Let's move to classification. Click the pull-down for **"Classified by"** and notice the three choices. The current selection, **"Manual"**, means that the user sets the break points individually. The manual method allowed us to have nice round numbers, but, under the **"Records"** column, you can see that different classes have different numbers of records.



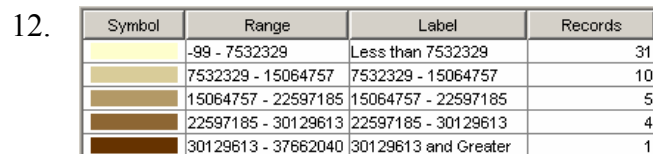
Suppose we want to have an even number of records in each class. Choose "**Quantile**." This will break the total universe of records (here, 50 states plus DC) into the number of groups identified in the "**Classes**" window.



Now, the 51 records are broken as evenly as possible, even if some of the break points between classes might be close together, and the ranges of values in classes might not be even. For instance, the span covered by the lightest color is under 1 million; the second and third spans cover about 3.5 million each; the fourth covers almost 10 million, and the last covers over 20 million. Click "**OK**" and see how the map changes.



It might be interesting to see how the map looks when the classes all cover a similar span. (Examples of equal interval groups would include "0-7, 7-14, 14-21" and "5-10, 10-15, 15-20".) Choose to classify by "**Equal Interval**" and see the results.



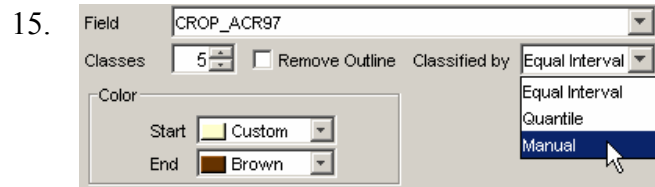
Now you can see that each class covers a span of similar size, but the number of records in a class varies widely. Click "**OK**" and see how the map changes.

13. It's important to note here that we did not change **WHAT** was being mapped, only **HOW** it was being mapped. The equal interval map looks very different from the other two. It's not necessarily "wrong", nor "right", just "different."

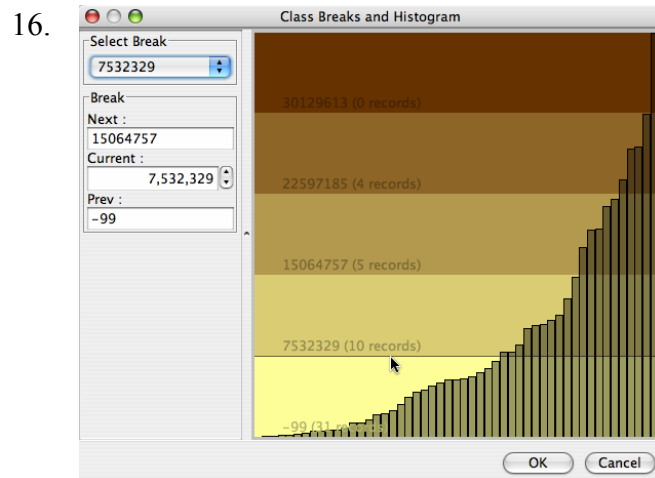
NOTE: Whether a map is "right" or "wrong" is a judgment call. Making maps involves communicating, and can be influenced by many things. Sometimes, people who want to emphasize a specific view of a topic can make their map in a certain way. It is important to remember that all maps are models – simplified representations of reality. The decisions made by the mapmaker can influence how the map viewer interprets the data.



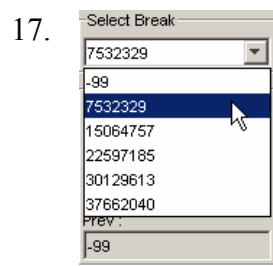
What if you don't want five classes? What if you want four, or six? Try changing the number of classes and seeing how that affects the map in "**Equal Interval**" and "**Quantile**" fashion.



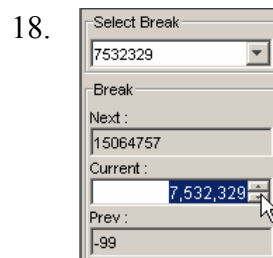
Set the number of classes back to five, and choose **"Manual"**. As soon as you select manual, a new window opens for **"Class Breaks and Histogram"**.



The colors show the range of values, and the vertical bars show the records within each class. (The color bands and numbers visible will depend on the classification used just before clicking "Manual".) Move the mouse on top of a line separating color bands in the histogram. By carefully clicking on the line separating color bands, you can drag the "breakpoint" up or down. As you drag, the break number will show the change. However, this method can leave you with breakpoints that are hard to use. Instead, let's use the number boxes at left to set breakpoints.



Click the **"Select Break"** pull-down. The two extreme numbers represent the top and bottom of the range and cannot be changed. We can only change the middle four numbers. Let's use the same breakpoints that we had at the start of the lesson: 1 million, 5 million, 10 million, and 20 million. We'll have to choose them one by one, and type the new number into the box for **"Current:"**



- In the **"Select Break"** pull-down, choose the second smallest number (here "7532329"). Highlight the number in the **"Current"** window by dragging your mouse across it, and erase it. Type "1000000" and press the Enter key on your keyboard. Notice that the pattern in the histogram shifts.
- In the **"Select Break"** pull-down, choose the third smallest number. Replace it with "5000000", and press the Enter key.
- In the **"Select Break"** pull-down, choose the next number. Replace it with "10000000", and press the Enter key.
- Finally, in the pull-down, choose the next to largest. Replace it with "20000000", and press the Enter key. Click "OK".

19.

Symbol	Range	Label	Records
	-99 - 1000000	Less than 1000000	12
	1000000 - 5000000	1000000 - 5000000	11
	5000000 - 10000000	5000000 - 10000000	11
	10000000 - 20000000	10000000 - 20000000	10
	20000000 - 37662040	20000000 and Grea...	7

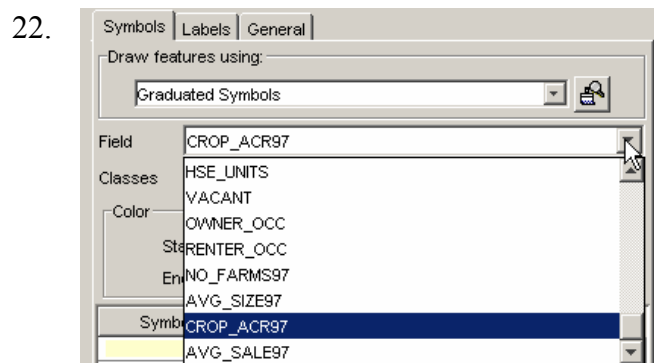
We now have nice, round numbers, but they're a little hard to read. You can't change the data in the **"Range"** column, but you can click in the **"Label"** column and change the text to your liking.

20.

Symbol	Range	Label	Records
	-99 - 1000000	< 1 M	12
	1000000 - 5000000	1 - 5 M	11
	5000000 - 10000000		11
	10000000 - 20000000	10000000 - 20000000	10
	20000000 - 37662040	20000000 and Grea...	7

Change the "Label" cells to read "<1M", "1 – 5 M", "5 – 10 M", "10 – 20 M", and "20 – 38 M". Click **"OK"**.

21. Now let's look at information about the people, from the 2000 Census.
Open the **"Properties"** window for **"states: CropAcres97"**

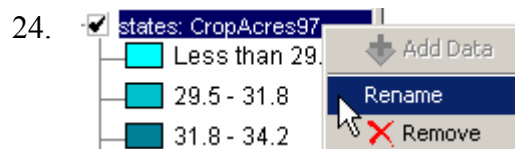


In the Symbol window, click the **"Field"** pull-down. Notice that **"CROP_ACR97"** is almost at the bottom of the list. Click on the "up/slider/down" buttons at the right of the window and scroll up to find **"MED_AGE"**, about halfway up the list. ("Median age" means half the people are younger than this and half the people are older than this.) Click it to choose it, and choose **"Equal Interval"** as the classification method.

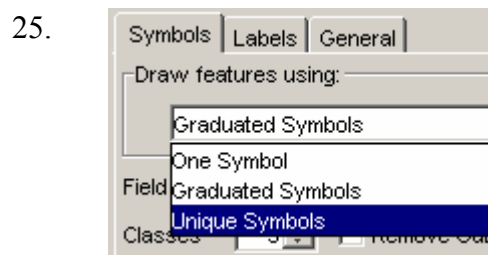
23.

Symbol	Range	Label	Records
	27.1 - 29.46	Less than 29.5	1
	29.46 - 31.82	29.5 - 31.8	0
	31.82 - 34.18	31.8 - 34.2	7
	34.18 - 36.54	34.2 - 36.5	32
	36.54 - 38.9	36.54 and Greater	11

The legend automatically uses the existing color scheme. Try some new colors, such as deep green to light gray, or bright green to deep purple, or cyan to navy. Click **"OK"** and see how things look on the map. Do colors stand out? Is it easy to tell the difference between the colors, and know what one state is? If you cover the legend, can you tell which states are the high and low numbers?



The map looks OK now, but the name in the legend is wrong. In the TOC, right-click on **"states: CropAcres97"** and rename it to **"states: MedianAge2000"**. (Press ENTER key to finish.)



Now let's see what other choices for symbol schemes are available. We have explored using **"Graduated Symbols"**, where numerical values get "ranked" and symbols are assigned accordingly. Now, let's try **"Unique Symbols"**, used where values vary but don't have a "rank" associated with these differences. Click the symbology pull-down and choose **"Unique Symbols"**.

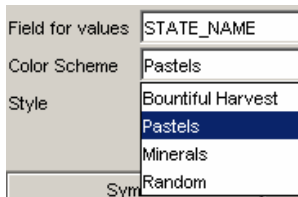
26.



Under "**Field for values**", choose "**STATE_NAME**". A random color scheme is applied by default. Click "**OK**" and see how you like the map. (And be sure to change the layer name to just "states".)

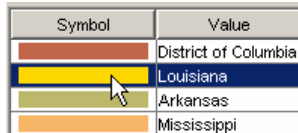
NOTE: For qualitative data, such as name, where there is no ranking implied, cartographers typically choose a randomized color scheme. For quantitative data, such as population or temperature, cartographers typically choose a graduated color scheme. The key in each case is to help the viewer understand the data. See the "Intro to Cartography" document referenced in the "Intro to AEJEE" for more guidance.

27.



If the "**Random**" colors are just a bit too bright for you, open the Properties window again and replace "**Random**" with "**Pastels**". Or try either of the other options. Notice that each method results in states having a somewhat random color applied.

28.



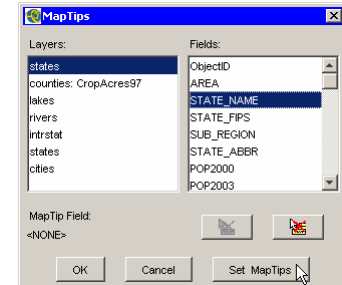
What if everything is fine but you need to change the color for a single state? Easy! In the "**Symbols**" window, click the color symbol for a specific state. In the color palette that appears, click the new color, then click "**OK**" and "**OK**" again to apply changes.

29.



The map looks interesting but it would be nice to have the two-letter postal codes appear on top of each state, to assist in identification. Open the "**Properties**" window for "**states**". At the top, click the "**Labels**" tab. Notice that the current listing for "**Label features using:**" reads "<None>". Change that to "**STATE_ABBR**". Leave the Font as is, but change the size to **12**. Click the "**Effects**" button and choose "**Glow**". Click "**OK**", and "**OK**" again to apply changes.

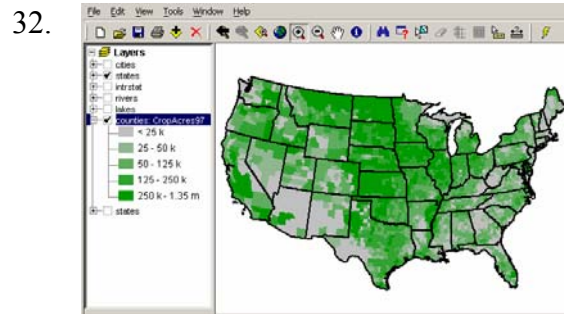
30.



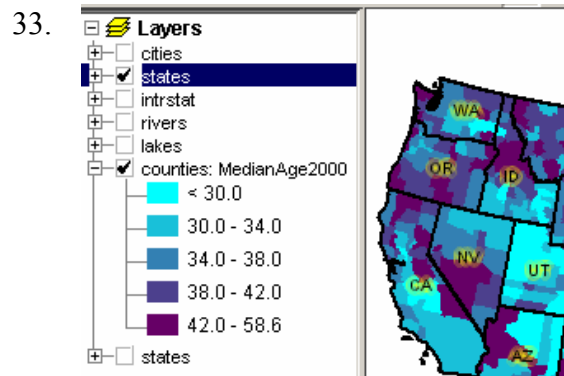
Finally, just in case you'd like a little more information about the state you're looking at, you can set "**MapTips**". This displays the contents of one field from one layer beneath the cursor as it moves around the map. In the Advanced toolbar, click the "**MapTips**" button. In the "**Layers**" column, choose the topmost "**states**" layer. In the "**Fields**" column, choose "**STATE_NAME**". Click "**Set MapTips**", then click "**OK**". Move your mouse slowly around the map, and see the changes. What would happen if you had chosen a population field? How many pieces of information can you display in a useful manner at one time?

31. **REVIEW:** In this lesson, we have covered the following ideas, tools, and capacities:

- Classification
- Symbolization
- Histogram
- Naming layers
- Labeling features



SELF CHECK: Now it's time to see if you can use these concepts and skills on a new layer of data. Turn off the bottom-most "**states**" layer, and turn on the topmost "**states**" layer and the "**counties: CropAcres97**" layer. Collapse the symbols of all the layers except for the counties by clicking the "+/-" box at the left of each layer. Your starting map should look like the one shown here.



Create a map of Median Age by county, using classes, symbology, and layer name as shown here. How many counties had a median age over 42.0?

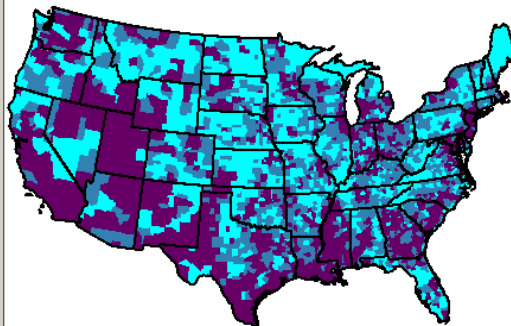
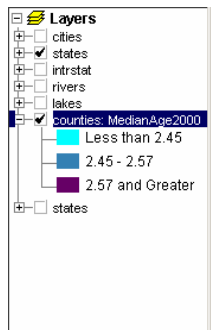
34. Create a county map using population per square mile in 2000 ("**POP00_SQMI**"). If you classify by quantiles into five classes, what is the range of the class with the narrowest range of values?

35. "Household size" looks at the number of people living in a single housing unit (apartment, townhome, house, etc.). Create a map of average household size ("**AVE_HH_SZ**") by county, using three classes divided in quantiles. Name three states that seem to have a large portion of the state showing large household size ____, and three states that seem to have a large portion of the state showing small household size ____.

FOR THE TEACHER:

- 32-A The key in setting up this map is to be sure to turn off the states layer at the bottom and turn on the states layer near the top of the TOC. Most of the work will be with the layer of counties, but you'll need to do some with the states.
- 33-A Creating a similar map requires changing the county mapping scheme ("MED_AGE" field, Manual classification method, cyan to purple colors) and noticing that 338 counties fall into the top class. Then the student needs to change the county layer name and set the "states" layer to provide labels using "STATE_ABBR".
- 34-A This requires the student to change the county field to "POP00_SQMI", change the method to "Quantile", and ensure there are five classes. Then the student needs to look at the ranges, and do the fairly simple mathematical comparison. The lowest class, "0.0-11.6", has the narrowest range of values.

35-A



Answers here will vary because the students are being asked to interpret. States that seem to have mostly higher counts might include AK, HI, NJ, UT, MS, CA. States that seem to include mostly lower counts might include ME, KS, ND, MT, IA.